

CHAPTER 6

EMS Approach to P2 Implementation

INTRODUCTION

The new international voluntary standard for environmental management systems (EMSs) known as ISO 14001 is proving to be an effective tool for improving organizational environmental performance and implementing P2 opportunities. The intent of the standard is to establish and maintain a systematic management plan designed to continually identify and reduce the environmental impacts resulting from an organization's activities, products, and services. Currently, no government mandate requires organizations to have a comprehensive EMS, but several states are exploring the effectiveness of having organizations use an EMS in implementing and complying with P2 planning requirements.

Government policymakers are interested in EMSs as a possible way to supplement the so-called "command-and-control" environmental regulations. The EPA recognizes that an EMS can help organizations integrate environmental considerations into day-to-day decisions and practices (References 6-1 and 6-2). EMSs will not replace existing regulatory systems in the United States but will work best when they complement the existing regulatory programs including formal enforcement actions. Other EMSs are emerging, but the focus of this chapter will be on the ISO 14001 standard's elements.

For several years, the EPA has been engaged in a number of important activities designed both to promote and evaluate the effectiveness of EMSs in a variety of settings. These activities vary widely and include (1) a major EMS research program conducted in partnership with states through the Multi-State Working Group (MSWG), (2) programs to promote and demonstrate the value of EMSs in various sectors such as local government and metal finishing, and (3) the use of EMSs as components of voluntary leadership programs. The EPA has also used EMSs as important components in enforcement settlement agreements. The MSWG has adopted a consensus policy document to help guide states and others in designing EMSs, evaluating EMS credibility, and participating in EMS processes (Reference 6-3). The principles are as follow:

- EMSs should improve compliance with environmental laws, enable organizations to achieve performance "beyond compliance" with legal requirements, and reduce environmental impacts from both regulated and unregulated activities.

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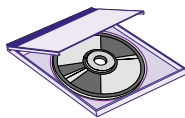
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The goal of the standard is to establish a common approach to EMSs that is internationally recognized, leads to improved environmental performance, and provides an opportunity for gaining international recognition and market share.

- An EMS can serve as a supplementary tool that enables regulatory agencies and others to jointly achieve greater environmental protection.
- The quality of an EMS is linked to environmental performance achieved.
- EMS metrics can document improved environmental performance, which may enable regulatory agencies to achieve policy objectives more efficiently and improve communications with the public.

A growing number of organizations have pioneered new strategies for integrating environmental management into their overall business strategy. Although regulatory compliance remains an important driver of environmental performance and of the adoption of advanced practices, business factors such as cost savings and improved business performance are just as important. EMSs are motivating organizations all over the world to reconsider their environmental performance and effectiveness and determine how P2 strategies can help them reduce wastes, risks, and costs. These organizations should establish and maintain a systematic management plan that promotes P2 and is designed to continually identify and reduce the environmental harm (impacts) created by the organization's activities, products, and services. The EMS fosters innovative strategies and a framework for improving environmental performance by encouraging all the employees of the organization to look for ways to reduce environmental impacts by first using P2 techniques. Supporting information on EMSs can be found on the CD-ROM that accompanies this *Guide*.

GETTING STARTED

Like other management systems, an EMS is a formal approach for articulating goals, making choices, gathering information, measuring progress, and improving performance. An EMS promotes important planning and improvement elements needed in the design of multimedia source reduction and recycling programs for all forms of pollution. Several elements of an EMS provide positive reinforcement for P2 assessment and planning efforts and add an element for continual review by management that is needed for implementation and improvement. Figure 6-1 is a top-level process map for implementing P2 using an EMS program.

The goal of the standard is to establish a common approach to EMSs that is internationally recognized, leads to improved environmental performance, and provides an opportunity for gaining international recognition and market share. ISO 14001 is a management system standard, not a performance standard. Given that ISO 14001 is a system built for industry by industry, it uses a language that management un-

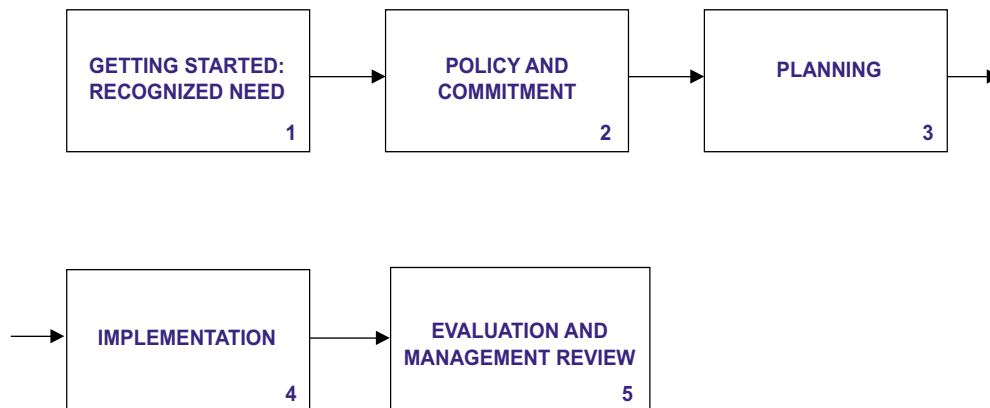


Figure 6-1. Implementing P2 Using an EMS Program (Top-level Process Map).

derstands, and it will keep top management's attention through involvement. The EMS provides a systematic approach for integrating environmental protection into all business functions and management strategies.

One important way the EMS standard promotes integration of environmental and organizational management is by requiring top management to define the environmental policy. However, the EMS approach to P2 encourages several initial activities prior to setting up the policy:

- Identifying current environmental compliance procedures and management techniques
- Reviewing the policies in place and environmental concerns for the future
- Ensuring that all relevant information is up to date
- Generating an environmental plan for continual involvement and improvement for the future

Figure 6-2 is a process map that shows these initial steps in the EMS approach to P2.

As an initial step in developing a comprehensive EMS, most organizations find it helpful to complete an objective gap analysis of their existing environmental system. This enables the organization to discover its current status regarding environmental performance and compliance and highlight areas that require attention under an EMS. The results of a "gap" analysis will provide a benchmark for the organization's alignment and conformance to the ISO 14001 standard. Many organizations are developing useful gap audit tools, including facilities, consultants, and technical assistance providers. The scope of the gap analysis audit should include all areas of the organization related to environmental systems as well as the interfaces between a specific facility and its corporate environmental department.

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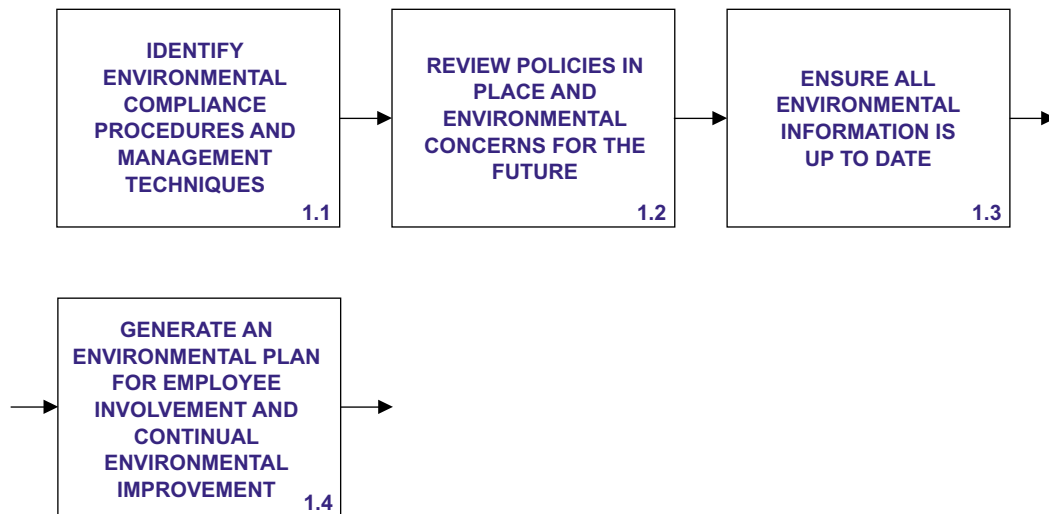


Figure 6-2. Getting Started—Recognized Need.

It is likely that top-level management will view an EMS as a competitiveness issue rather than as a cost center for environmental compliance.

Command and control standards give organizations no incentive to exceed what is necessary for compliance.

EMSs require that organizations have a “commitment to comply with relevant environmental legislation and regulations, and with other requirements to which the organization subscribes.” An organization’s current practices for tracking compliance are a good place to start, and they should be compared to what an EMS entails. An EMS aligned to ISO 14001 requirements offers the potential for delivering substantial gains in production and environmental efficiency and reduced costs in environmental compliance. It is likely that top-level management will view an EMS as a competitiveness issue rather than as a cost center for environmental compliance. Involvement of top management in defining policy, reviewing the current plan, and maintaining EMS awareness is seen as a positive outcome by many since management has sometimes been a tough audience to reach on environmental issues.

An organization has to prove that its EMS has been implemented effectively and leads to compliance over time. The organization must have a procedure to identify and have access to legal and other requirements to which it subscribes. Periodic compliance and EMS system audits are required to assess procedural improvements and identify needed system improvements through corrective actions. Such a mechanism for improvement is completely absent in command-and-control regulations such as BAT (best available technology) standards and emission standards. Standards such as these give organizations no incentive to exceed what is necessary for compliance. In some cases, they may encourage the use of control technologies over other approaches that would result in better environmental performance. Command and control standards give organizations no incentive to exceed what is necessary for compliance.

Another regulatory advantage of an EMS is the requirement to consider legal and other requirements when establishing objectives and

targets for the significant aspects. The potential for exchange between an EMS and state P2 facility planning requirements is generating interest among environmental regulators in several states. As part of the MSWG initiative, the state of Washington studied organizations using ISO 14001 and concluded, “EMSs are proving to be a superior approach for implementing P2 assessments and planning activities.” They allow the EMS to meet the organization’s planning requirements if the waste management hierarchy is followed in setting objectives and targets. The EPA’s Environmental Performance Track program has developed a matrix of several other state programs that have modified their requirements, and it can be found on their Web site (Reference 6-4).

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ENVIRONMENTAL POLICY, MANAGEMENT COMMITMENT, AND SCOPE OF THE EMS

Based on the current environmental assessment and performance, it is management’s responsibility to develop a shared vision and direction for the organization’s EMS policy and to commit to its implementation (Figure 6-3, work steps 2.1, 2.2, 2.3). In the policy, management defines its scope and ensures consistency with the organization’s vision, core values, beliefs, and other goals. Management may use the new policy to expand the organization’s environmental perspective. The environmental policy for an EMS contains the following commitments:

- Commitment to “prevention of pollution”
- Commitment to compliance with all applicable requirements and other requirements to which the organization subscribes
- Commitment to continual improvement of the system itself and not specifically continued improvement of the required environmental performance criteria.

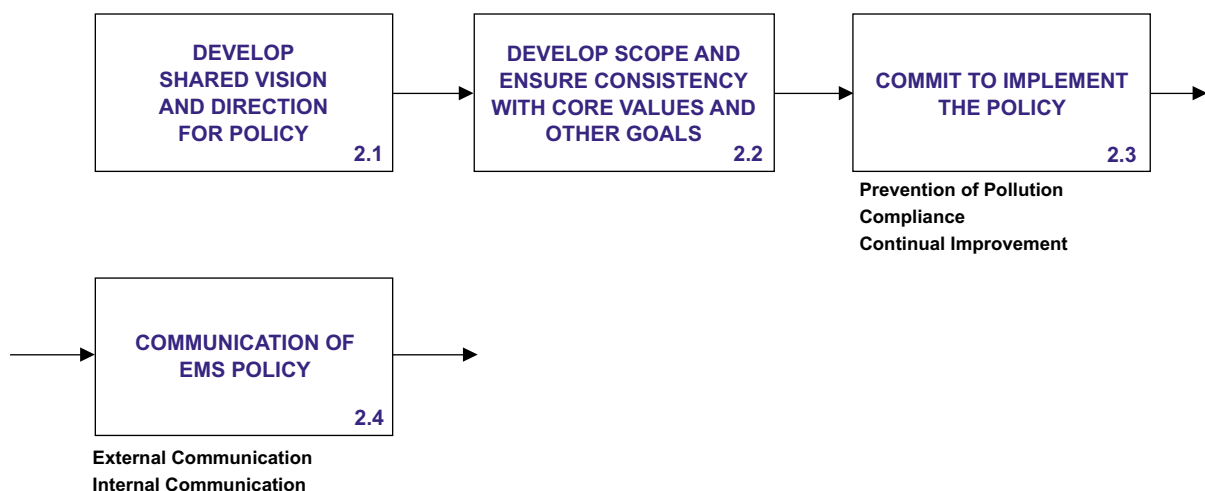


Figure 6-3. Policy and Commitment: Define Environmental Policy, Scope, and Commitment.

*Prevention of pollution is defined by the standard as “**use of processes, practices, materials or products that avoid, reduce or control pollution, which may include recycling, treatment, process changes, control mechanisms, efficient use of resources and material substitution.**”*

The EMS standard requires the environmental policy of the organization be made available to the public.

The EMS requires the organization to develop and implement procedures to ensure internal communication of the EMS policy, responsibilities, and results.

P2 is different from prevention of pollution as defined in the EMS standard. Prevention of pollution is defined by the standard as “**use of processes, practices, materials or products that avoid, reduce or control pollution, which may include recycling, treatment, process changes, control mechanisms, efficient use of resources and material substitution.**” This definition does include control and treatment scenarios but the phrases indicated in bold in the definition provide a clear mandate in the policy to pursue source reduction as a goal and objective of the EMS.

The EMS policy is used as the guidance for setting and reviewing the organization’s environmental objectives and targets. The EMS standard does not require specific environmental goals. Instead, it provides a general framework for organizing the tasks necessary for effective environmental management and improved performance.

Communication of the EMS Policy

Once management reaches agreement on the policy, it should be documented, kept up-to-date, and used by all employees. Most organizations already have procedures in place on how they communicate their policies internally and externally (Figure 6-3, work step 2.4). The EMS standard requires that the environmental policy of the organization be made available to the public. Many organizations already provide far more environmental information through P2 plans, annual reports, regulatory records, and participation in emergency response planning.

An EMS addresses the process for responding to external communications or requests for environmental information. The organization documents its procedure on “how to” respond to these external requests for information on the EMS, environmental aspects, and P2, if and when they occur. The basic documentation an organization should keep for external requests includes who made the contact, the date, the nature of the request, the nature of the response, and what, if any, materials were sent.

The EMS requires the organization to develop and implement procedures to ensure internal communication of the EMS policy, responsibilities, and results. The EMS and environmental “aspects” need to be communicated to all internal levels of the organization and job functions that could impact the environment. The internal communication procedure specifies whose responsibility it will be to communicate changes relating to the EMS and environmental aspects. Changes may include environmental information, such as revised objectives and targets, changes in procedures, and environmental incidents or regulatory changes. Another internal communication “how to” is a process for responding to employee requests and concerns related to the EMS and P2. Internal communication should include discussions of general and useful P2 opportunities that apply to all wastes and losses identified in the organization.

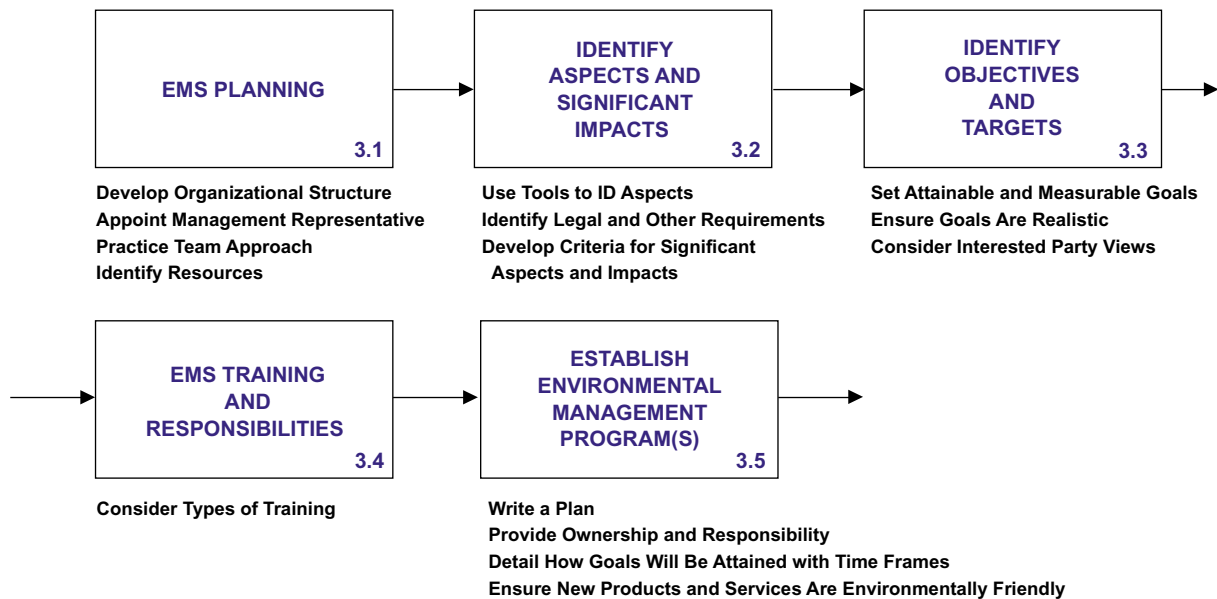


Figure 6-4. Planning in the EMS.

EMS PLANNING

As an organization grows and as product lines change, planning is necessary. Planning for P2 should go hand in hand with any business planning effort (Figure 6-4, work step 3.1). Unfocused, ill-timed, or poorly managed P2 efforts will lead to low performance and high cost. Conversely, a well-conceived and effectively implemented P2 program leads to high performance and reduced costs. Improved environmental performance is an important benefit for most organizations undertaking EMS development and implementation. Although some organizations have comprehensive EMSs that systematically track environmentally relevant activities, many do not. An EMS includes organizational structure, responsibilities, practices, procedures, processes, and resources for implementing effective environmental management.

Top management appoints a management representative or representatives to ensure the organization accomplishes its goals when establishing an EMS. The management representative monitors and evaluates the system and reports to top management on the EMS's effectiveness. The coordinator(s) works with organizational teams to generate new ideas and modify the EMS when necessary for improvement. The organization could create an environment and select a forum in which creative ideas can be heard and tried.

Most organizations choose to meet in teams to discuss production and wastes and develop questions for needed checklists. Teams are used to multiply the strength of the organization. The team approach

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These teams can be used to identify, evaluate, and implement P2 opportunities.

Teams are authorized to take direct action, make decisions, and initiate changes that result in continual improvement.

The EMS is driven by environmental impacts.

An organization's aspects may include waste generation and pollution, resource utilization and depletion, energy generation and utilization, and other ecological impacts on the environment.

allows for discussion and comparison of differences. It may be useful to set up self-managing P2 teams chosen from all levels of the organization. The involvement of several levels of management in these discussions, normally in several groups, improves their usefulness. Clearly identifiable teams are the primary means of organizing the EMS work, as opposed to individual job functions or independent work areas. These teams can be used to identify, evaluate, and implement P2 opportunities.

Teams are authorized to take direct action, make decisions, and initiate changes that result in continual improvement of the EMS to comply with the policy and achieve the organization's objectives and targets. When the employees' roles have been formally structured to support the work team approach, members can rely on one another for cross training, problem solving, administrative duties, and mutual support. Opportunities for waste elimination, reduction, reuse, recycling, and energy and water conservation are addressed by a P2 team of the most appropriate people regardless of their reporting level in the organization.

Identification of Aspects and Significant Environmental Impacts

The EMS is driven by environmental impacts. An EMS encourages organizations to systematically address the environmental impacts of their activities, products, and services (Figure 6-4, work step 3.2). This systematic approach may prove effective in encouraging organizations to take a proactive and P2 approach to managing their environmental impacts and programs. An organization's aspects may include waste generation and pollution, resource utilization and depletion, energy generation and utilization, and other ecological impacts on the environment.

Aspect—element of an organization's activities, products, or services that can interact with the environment.

The standard outlines a core set of planning activities that are used in many organizations to assess and implement P2. This planning ensures a facility will:

- Identify facility activities, operations, processes, services, and products that have environmental impacts
- Identify all legal requirements that apply to the organization's activities, products, and services
- Evaluate which environmental impacts are significant
- Set objectives and targets for reducing negative environmental impacts
- Select and implement activities through environmental management program(s) to achieve the identified targets

Through the procedure of aspect identification and ranking, P2 should emerge as a core part of the environmental management plan(s). The P2 assessment is a systematic, periodic survey of the organization's operations designed to identify areas of potential waste reduction and conservation. A well-designed EMS can go far beyond the traditional process-driven view for characterization of wastes and losses. In evaluating all of its environmental aspects, an organization can take activities such as solid waste, energy and water use, landscaping, commuting, sound, and other impacts into consideration although they are not regulated. The organization can question suppliers about contents of materials, use and types of packaging, and methods of delivery. Aspect identification procedures include the following:

- Process mapping
- Interviews
- Questionnaires
- Checklists
- Benchmarking
- Cost/benefit, energy, and life cycle analysis
- Inspections and audits
- Review of records and emergency responses
- Material balances of inputs and outputs

Consideration of operating conditions and controls and their effect on environmental impacts is an important part of identifying the organization's significant aspects. The organization should select criteria to determine the significance of its aspects. The criteria might include regulated activities, costs to manage, and risks associated with use of raw materials. What is most important is that the criteria reflect the organization's values as stated in the policy. Several good examples of ranking potential significant aspects/impacts can be found in US EPA's *Integrated Environmental Management Systems Implementation Guide* and NSF International's *Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations* (References 6-4 and 6-5). See the CD-ROM for more information on EMSs.

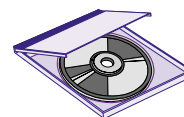
Identifying operations and monitoring and measuring activities associated with significant environmental aspects leads to the development of procedures that minimize the risk of those environmental impacts. This systematic approach can help foster P2 solutions by encouraging an organization to identify opportunities for doing things in new ways, for finding new products from "waste," and for going beyond the traditional view that environmental issues are the responsibility of the environmental, health, and safety managers.

Typically, organizations separate their environmental strategies by media—land, air, and water—to address their environmental impacts

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A multimedia EMS approach will ensure all significant aspects are identified that impact the environment and are costly for the organization.

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and compliance with various environmental regulations. This leads to a single media dependence on reactive and end-of-pipe strategies that are potentially inefficient and costly. Many organizations that have instituted a thorough EMS have benefited by becoming aware of inefficiencies that were not apparent previously. Correcting these inefficiencies generates cost savings and reduced environmental liabilities. A multimedia EMS approach will ensure all significant aspects are identified that impact the environment and are costly for the organization.

The organization benefits by involving suppliers and contractors in the EMS procedures and requirements for certain significant environmental aspects they could impact. Identification of health and environmental concerns associated with the raw materials used by an organization is important in assessing the significance of environmental aspects associated with that materials' use. It may be necessary to provide training and guidance to outside organizations whose actions onsite may create an aspect or impact the organization's environment. This provides a forum for the two organizations to investigate goods and services for P2 opportunities. From improving efficiencies to changing basic processes, design has played an important role in reducing waste. Good supplier partnerships can result in designing for P2 and meeting the objectives and targets established for the EMS.

An organization may choose to modify an existing assessment tool or develop a procedure for identifying all the organization's environmental aspects and their significance. Use a team approach during this planning phase and keep the aspects' list updated. Prioritize the significant aspects to begin addressing opportunities to improve the organization's impact on the environment. Finally, remember to look beyond regulatory requirements and your organization's boundary when considering your organization's aspects and invite input from all interested parties.

EMS Objectives and Targets

The EMS sets explicit goals by establishing and maintaining objectives and targets for improvement (Figure 6-4, work step 3.3). The EMS's objectives and targets are the most important place for articulating P2 planning goals. Although an organization has discretion with regard to its objectives and targets, they must be consistent with the organization's environmental policy containing a commitment to prevention of pollution that helps reinforce source reduction goals and compliance with state P2 planning laws.

Objectives—overall environmental goals that an organization sets out to achieve.

Targets—detailed performance requirements that are set and met to achieve the environmental objectives.

Again, P2 (source reduction) practices and techniques succeed best when promoted as the number one strategy for improving environmental performance and meeting attainable and measurable goals. In setting the EMS's objectives and targets, the organization must consider (1) significant environmental aspects, (2) legal and other requirements, (3) the views of external parties and societal concerns, (4) technical options and operational feasibility, (5) financial requirements for paybacks, and (6) business requirements for marketability and profitability. All of these are usually taken into consideration when P2 opportunities are being examined for inclusion in an organization's P2 plan.

An EMS encourages innovative P2 solutions to waste and loss problems at all levels of the organization. Documented objectives and targets of the EMS must be provided for all relevant levels and functions of the organization that impact the environment. The objectives and targets may be different for various levels of the organization such as management, plant engineer, and line supervisors and operators. The keys are consistency with the environmental policy and the inclusion of P2. The EMS standard requires organizations to set objectives and targets for reducing their environmental impacts, select activities to achieve the identified targets, and then use a continual improvement cycle to evaluate and correct the system.

EMS Training and Responsibility

The EMS requires that all employees be made aware of their environmental responsibilities and trained to exercise care when performing duties with environmental consequences (Figure 6-4, work step 3.4). Consider what type of EMS training is needed to achieve the organization's objectives and targets and integrate this training into existing environmental, health and safety, and emergency preparedness training programs. This training requirement provides the opportunity to involve all employees in P2. If the absence of correct procedures could lead to deviations from your EMS policy, objectives, or targets, the procedure or work instruction should be documented and used in training. This is an extremely important part of a successful EMS.

Employees will need to be trained in the procedures relevant to their roles and responsibilities for meeting the objectives and targets and in the potential results of departure from specified operating procedures. It is important to ensure that EMS internal auditors are trained and familiar with the waste management hierarchy and P2 strategies. Training will ensure that EMS objectives and targets are assessed and are being met using source reduction methods.

One company created a bulletin board displaying the company's policy, significant aspects and impacts, and objectives and targets of the EMS. During morning line meetings, the line supervisors went with the line team to the bulletin board and reviewed this information all the

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way up to the week of the ISO 14001 registration audit. This approach was excellent for several reasons: (1) it built on a system already in place, (2) the regular meeting established and reinforced the importance of knowing this information, and (3) the employees knew where to go when the auditors asked them questions about these areas of the EMS.

Often, it is the employees most familiar with the organization's production processes who are in the best position to identify P2 projects for improving environmental program performance.

By providing environmental awareness training for all employees, an organization can count on the technical know-how of employees on the production floor to help find creative P2 strategies to reduce their environmental impacts. With respect to training competency, the EMS standard asks that the organization determine what qualifications (education, training, and/or experience) are necessary and to ensure that each employee completes these requirements for his/her job. Often, it is the employees most familiar with the organization's production processes who are in the best position to identify P2 projects for improving environmental program performance. Just as an organization uses incentives to boost employee productivity, management should provide incentives for developing useful ideas to reduce waste.

Environmental Management Programs (EMPs)

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The EMS is designed to continually improve system and environmental performance through creation of an environmental management program (EMP). The EMP is the last element of the EMS planning phase (Figure 6-4, work step 3.5). It sets up action items, assigns responsibilities at all levels of the organization for plan execution, sets specific time lines, and determines the resources needed for implementation to achieve the objectives and targets. With the goals established, the subset of activities defined, and the accountabilities in place, each person with specific responsibilities must now develop EMPs for implementation. One person or several people are assigned the accountability for meeting the goals and objectives in the planned time frame for each task in the action plan and for maintaining the current level of performance on each of these items.

Although setting objectives and targets is treated as a separate function from EMPs in the planning phase, they are related. You have to have an idea of how you will accomplish an objective and target before you set it up as a program in your system. This is the process many organizations now use in their P2 planning effort to accomplish specific projects. After P2 assessment and planning, projects are initiated to implement technically and economically feasible P2 opportunities. Without the continual improvement component of the EMS, however, P2 planning and implementation may be an end point instead of the ongoing process of setting new objectives and targets for other aspects that impact the environment.

The number of EMPs that an organization sets up can vary. One company uses one EMP to address all of its objectives and targets.

Another company set up four EMPs for dealing with (1) all regulated aspects, (2) solid waste, (3) energy usage, and (4) PCB elimination. Finally, one company's EMPs were developed largely at the departmental level. The EMP(s) and objectives are reviewed by the team when changes occur in the organization's operations. When objectives and targets are not met, corrective actions are identified and taken.

As progress is made, it should be recorded against the EMPs created. Some questions and progress can be measured quantitatively. Other questions are more subjective, but progress can still be measured. The purpose is to monitor progress on currently active EMPs and watch for slippage on implemented activities. As with any implementation review, the questions to ask are the following:

- Have the milestones been achieved?
- If not, what can be done to bring this stage of implementation back on schedule?
- What issues need to be resolved to continue our progress?

EMS IMPLEMENTATION

At present, there is a clear need for careful evaluation of how an EMS will influence an organization's environmental effectiveness. This evaluation will facilitate more informed decision-making about how best to incorporate an EMS approach into existing environmental regulatory programs and P2 planning. At this point, many organizations already have sophisticated EMSs in place and perceive little customer demand or regulatory advantage to seek full registration. Many are aligning with the standard, however, and are aware that third-party auditing may become necessary in the future.

Most organizations already have regulatory and P2 procedures including work instructions, batch sheets, training records, testing and monitoring results, controls to meet permit operating limits, and calibration instructions (Figure 6-5, work step 4.1). Build on your existing documentation whenever you can if it is appropriate. The working documents provide the detailed "how to" and step-by-step instructions needed to perform tasks. Document the system requirements to meet your business needs and keep it simple.

If instructions and documentation do not add value to operational control, question whether they are needed. Not every department in the organization will need the same amount or detail in documentation. Factors that can affect the need to document procedures include the risk and complexity of the activity and the frequency and degree of supervision needed to perform the activity. Organizational teams should identify gaps in the existing documentation and initiate new procedures to ensure continual improvement.

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Records document that the organization is doing what it said it would, and they include forms, labels, tags, logbooks, and correspondences. Important record system questions are the following:

- How will records be collected?
- Where will records be filed?
- How will records be filed?
- How will records be disposed (recycled)?

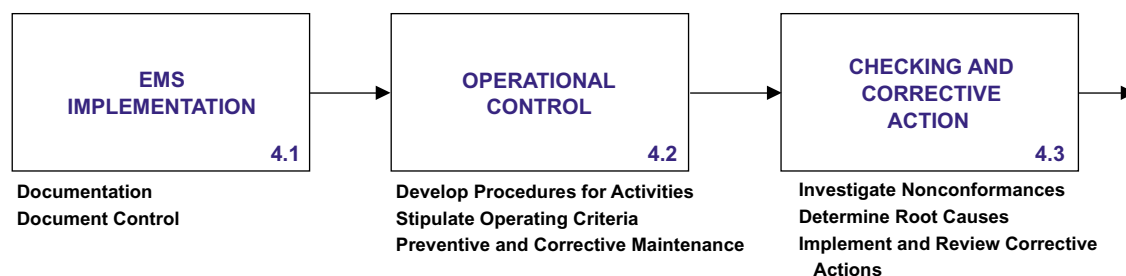


Figure 6-5. Implementation of the EMS.

Implementation of operational controls is the “do” part of the EMS cycle of “plan, do, check, review.”

The important step for operational control is identifying activities and employee job functions that can have a potential or actual impact on the environment.

Good operational control for P2 is defined as a procedure or process within an organization that reduces multimedia wastes and conserves natural resources.

Operational Control

Implementation of operational controls is the “do” part of the EMS cycle of “plan, do, check, review” (Figure 6-5, work step 4.2). Procedures are instructions used by the organization for environmental system activities such as P2. They define the details of who, what, when, where, and why in the EMS activities and include some generic “how to’s.” This is where most organizations expend the most effort while implementing an EMS. Because procedures are extremely important, the organization will benefit from determining which procedures to document and how to best write them for guidance and training. Written procedures are an essential element of operational control if the absence of these procedures could lead to deviations from the environmental policy, objectives, and targets.

The important step for operational control is identifying activities and employee job functions that can have a potential or actual impact on the environment. Operational controls established for significant environmental impacts help the organization determine the roles, responsibilities, and authorities needed to ensure performance. You stipulate operating criteria for employees in these improved standard procedures. Large amounts of waste may be generated through improper storage practices, inefficient production start-up or shutdown, scheduling problems, lack of preventive maintenance, or poorly calibrated devices for pollution control. Good operational control for P2 is defined as a procedure or process within an organization that reduces multimedia wastes and conserves natural resources.

Process changes can result in new operational controls that reduce waste at the source, primarily during production. Good operating procedures and improved housekeeping are the simplest P2 practices. Improved housekeeping relies on using good common sense and is often the most effective first step toward waste reduction. By properly labeling materials and wastes, an organization can reduce the risk of misuse or disposal of the wrong substance. By properly separating wastes, an organization can assess the potential for reuse, recycling, or exchange of the materials. Inventory control and handling materials properly, including storage, will reduce loss of input materials and reduce expired shelf life of time-sensitive materials.

Good operating procedures and improved housekeeping are the simplest P2 practices.

Substituting less toxic raw materials may be difficult in certain situations, but it can be an efficient part of P2 operational control to reduce multimedia wastes. Changes may include equipment, layout, piping changes, use of automation, waste concentration or volume reduction, and energy conservation. Operational control ensures that equipment is working properly and avoids faulty valves or pipes leaking materials that become contaminated and a waste. Preventive maintenance procedures are designed to reduce incidents of equipment breakdowns, inefficiency, or process fluid leakage. Another important operational control is corrective maintenance, such as resetting control valves or adjusting process temperatures to increase efficiency and prevent raw material loss and waste generation.

Substituting less toxic raw materials may be difficult in certain situations, but it can be an efficient part of P2 operational control to reduce multimedia wastes.

The basic steps to success in P2 through operational control include building on existing systems, establishing procedures, assigning responsibility, determining access, communicating and training, and auditing procedures and records. These procedures are the core of a P2 program's operational phase and are often the "low-hanging fruit" that are within easy reach. Without a Systems Approach, much of the P2 "low-hanging fruit" will be lying on the ground.

Checking and Corrective Action

The checking and corrective action element in the EMS is the main focus for continual improvement (Figure 6-5, work step 4.3). Management involvement and commitment to reducing waste needs to deal successfully with checking and corrective action. P2 may benefit from closer supervision to improve production efficiency and reduce inadvertent waste generation through early detection of mistakes. EMSs ensure that nonconformances to procedures are investigated, that root causes of the nonconformity are identified, and that corrective and preventive actions are implemented, documented, and reviewed. This type of analysis leads to increased efficiency of the EMS and P2 through improved performance.

The checking and corrective action element in the EMS is the main focus for continual improvement.

As systems are put in place, it makes sense to establish measuring processes on how well the system is working, identify actual or

potential problems, and act to eliminate them. This element of the EMS establishes measures of environmental performance and identifies where corrective actions are needed, if any. Organizations that have implemented an EMS have realized internal efficiency gains. Internal efficiency gains may be realized by the identification of root causes of waste and by easier access to environmental reporting information, records, and permits.

EMS MONITORING AND MEASUREMENT

The EMS standard requires procedures to monitor and measure your environmental performance, to record information that allows performance tracking of operational controls and conformance with the objectives and targets, and to evaluate compliance with environmental regulations.

Determining what to monitor and measure and what information to record is critical.

The EMS standard requires procedures to monitor and measure your environmental performance, to record information that allows performance tracking of operational controls and conformance with the objectives and targets, and to evaluate compliance with environmental regulations (Figure 6-6, work step 5.1). This element leads to success in determining real measurements that can be communicated internally or externally.

Determining what to monitor and measure and what information to record is critical. The objectives and especially the targets of the EMS are quantifiable and measurable so that progress toward achieving them can be tracked. EMS measures are used as environmental performance indicators. Legal and other requirements were considered in setting objectives and targets so monitoring of effluents and air emissions are measured and tracked. Key operational characteristics and parameters associated with significant environmental aspects are tracked and can serve as measures. Choose the number of indicators carefully—too many create information overload and an ineffective system, but too few mean you won't have enough information to make good business decisions. To ensure good measurement, the key questions to answer are the following:

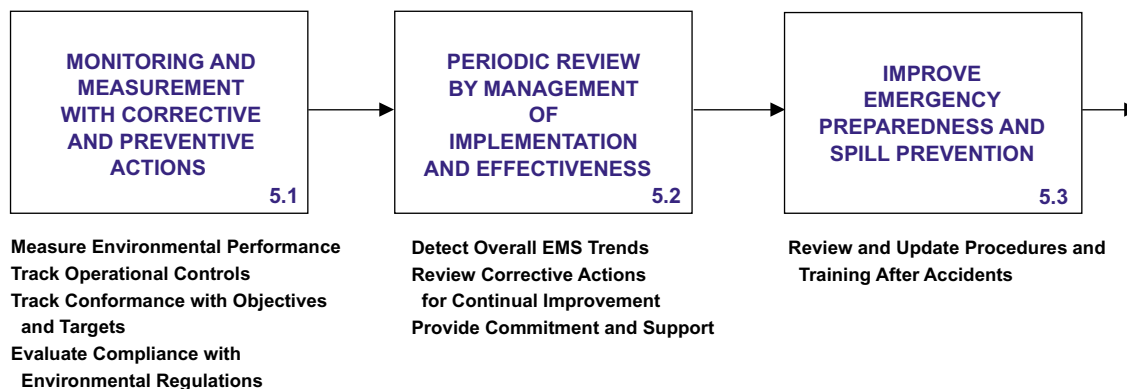


Figure 6-6. Evaluation and Management Review.

- Who is responsible for tracking, analyzing, compiling, and reporting data?
- What is the frequency of measurement for data?
- How will data be analyzed/compiled?
- How will data be reported?

Although the organization may be monitoring data on a hourly or daily basis for compliance purposes, the data will be used more strategically for the EMS. Monitoring will be used to detect overall trends and the possible need for corrective and preventive action. In this way, the organization may identify gradually declining performance and will be able to reverse it before a nonconformance, noncompliance, or other incident occurs.

Many companies are already evaluating their compliance in at least one of two ways: through compliance audits or through monitoring of regulatory permits. An environmental compliance audit compares an organization's performance with a set of environmental requirements relying largely on following a paper trail of permits, sampling data, and reports. Auditing the EMS's actual performance is different because it focuses on employees from various levels and job functions within the organization and their actions. A compliance audit compares an organization's performance to environmental requirements while an EMS audit focuses on employees and their actions.

There are two types of environmental solutions: short term to fix the immediate problem and long term to prevent the problem from recurring. The focus of the EMS and P2 is on the long-term solutions that eliminate or reduce the organization's environmental aspects and impacts. The first step to implementing a long-term solution is to develop plans that assign responsibility, determine progress dates, and designate needed resources to complete the corrective actions. If at some point the initial solution does not work, it may mean the true root cause was not correctly identified. At this point, generate new solutions and record the reason for the change.

A compliance audit compares an organization's performance to environmental requirements while an EMS audit focuses on employees and their actions.

The focus of the EMS and P2 is on the long-term solutions that eliminate or reduce the organization's environmental aspects and impacts.

Management Review and Continual Improvement

An EMS encourages a systematic approach to improving environmental procedures and performance through continual improvement. Top management periodically reviews EMS implementation and effectiveness (Figure 6-6, work step 5.2). Experience has shown that the effectiveness of management directly affects the chances of a successful EMS. EMSs are business systems that allow organizations to manage their environmental issues in a systematic, organized fashion based on continual improvement—just like any other area of business such as quality, purchasing and inventory control, accounting and payroll, and cash flow. Like these other areas, EMSs focus on top management support and commitment, accountability, employee involvement, responsibility and training, documentation, operational controls,

An EMS encourages a systematic approach to improving environmental procedures and performance through continual improvement.

EMSs focus on top management support and commitment, accountability, employee involvement, responsibility and training, documentation, operational controls, preventive actions, and periodic checking and review with corrective action.

The EMS must include preventive actions and how to mitigate environmental impacts. Improving emergency preparedness procedures reduces accidental and material losses while maintaining or increasing productivity.

When it comes to developing solutions, the EMS stipulates that the corrective and preventive actions be appropriate to the magnitude of the problem and commensurate with the environmental impact encountered.

preventive actions, and periodic checking and review with corrective action.

If a nonconformance has occurred, the responsible employees determine how to correct it and prevent it from recurring. Management review provides a broader, strategic look at the EMS and may be a source of direction on preventing nonconformance. There are many tools for developing solutions that have been discussed previously. The next step is to prioritize the solutions for possible implementation. Use of traditional business tools for prioritizing solutions can be used, such as cost-benefit analysis.

Emergency Preparedness and Spill Prevention

Accidents and emergency situations can create environmental impacts. Large amounts of waste may be generated through spills and lack of emergency response procedures. The EMS must include preventive actions and how to mitigate environmental impacts. Improving emergency preparedness procedures reduces accidental and material losses while maintaining or increasing productivity (Figure 6-6, work step 5.3).

Studies to implement preventive and corrective maintenance, emergency response, spill prevention, and P2 programs should be undertaken and their findings incorporated into the operational control procedures. Improved procedures can range from a change in management approach to a change in waste handling practices and must be a part of the overall emergency plan for the organization.

Preventive procedures should be reviewed and updated when necessary after accidents and emergency situations. When it comes to developing solutions, the EMS stipulates that the corrective and preventive actions be appropriate to the magnitude of the problem and commensurate with the environmental impact encountered. P2 can be implemented by changing existing procedures to reduce waste resulting from the cleanup of spills or leaks. Emergency plans already developed can be referenced in the overall emergency preparedness and response procedure of the EMS.

LESSONS LEARNED

The EMS is based on a documented and clearly communicated policy that includes three distinct guiding principles: compliance with applicable environmental requirements, prevention of pollution, and a commitment to continual improvement in environmental performance. In some cases, organizations' environmental policies, especially corporate policies, may have become too long and broad to be understood easily by employees and the public. An organization's EMS policy needs only to focus on the three guiding principles and to drive the accomplishment of the EMS's objectives and targets through training and involvement.

An EMS identifies, translates, and communicates applicable environmental and voluntary requirements to affected employees, suppliers, and contractors. Voluntary requirements may include those addressing P2, company or corporate initiatives, health, process safety management (PSM), and sustainable development. Health and PSM tend to be mandatory requirements of the Occupational Safety and Health Administration (OSHA). EPA's Green Lights, Climate Wise, Project XL, Design for the Environment (DfE), Environmentally Preferable Purchasing Program (Reference 6-9), and the American Chemistry Council's (ACC) Responsible Care® are examples of voluntary initiatives. Refer to the CD-ROM for more information on these programs. Standard operating procedures ensure that the employees, suppliers, and contractors can meet the EMS's requirements.

Compliance with Environmental Regulation

The EMS specifies procedures for how compliance will be achieved and maintained organizationally. For example, it defines the compliance roles and responsibilities of environmental managers, establishes how they and management will be held accountable for achieving and maintaining compliance, and describes how environmental performance and compliance information will be communicated to relevant employees, suppliers, and contractors. The EMS establishes a mechanism for receiving and addressing environmental and compliance concerns raised by individuals, organizations, or other interested parties.

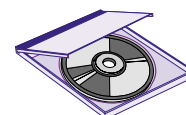
The EMS includes procedures for identifying changes to applicable environmental requirements—including new ones that may apply as a result of process or material changes—and addressing these changes through the EMS process. For those organizations that are already performing environmentally, the EMS should establish objectives and targets that promote leadership and ensure continued achievement of compliance.

Prevention of Pollution

Identifying all aspects and determining their significance is usually the largest gap in most organizations' current environmental systems. The EMS establishes and maintains a procedure to identify all of the environmental aspects of the organization's activities, products, and services that it controls and influences. Current procedures to identify existing process waste streams and review new customer work requests can be used as starting points for identifying all aspects. Also, a procedure to identify which of these aspects have significant impact on the environment is needed, and significant impacts must be considered in setting objectives.

Many organizations focus almost exclusively on negative environmental impacts. Positive environmental impacts are also important. These might include company-sponsored community recycling pro-

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Standard operating procedures ensure that the employees, suppliers, and contractors can meet the EMS's requirements.

The EMS establishes a mechanism for receiving and addressing environmental and compliance concerns raised by individuals, organizations, or other interested parties.

The EMS should establish objectives and targets that promote a leadership and ensure continued achievement of compliance.

An EMS establishes specific objectives, targets, and time frames for implementing P2 initiatives, improving environmental performance, and maintaining compliance.

EMP requirements specifically include designation of responsibility for actions and the means and time frame by which the objectives are to be achieved.

The EMS identifies and provides for the planning and management of all the organization's operations and activities, including facility maintenance, in order to achieve operational control and maintain compliance.

The EMS also establishes documented procedures for mitigating any adverse impacts on the environment that may be associated with accidents or emergencies.

grams and household hazardous waste collection days. An EMS can develop approaches to procurement, processing, and delivery that reduce or minimize significant environmental impacts for organizations, customers, and interested parties.

An EMS establishes specific objectives, targets, and time frames for implementing P2 initiatives, improving environmental performance, and maintaining compliance. These should be documented and updated. An EMS ensures that the organization has skilled employees and financial and technical resources to achieve its objectives and targets and maintain compliance. In setting objectives and targets for each relevant job within the organization, it is important to consider pollution prevention goals; any additional significant impacts; legal and other requirements; technological options; financial, operational, and business requirements; and views of interested parties. These considerations are important in EMS planning and are used for capital improvement decisions, product and process design, training programs, and maintenance activities.

The organization establishes environmental management programs (EMPs) to achieve its EMS objectives and targets. EMP requirements specifically include designation of responsibility for actions and the means and time frame by which the objectives are to be achieved. The EMP must review new activities, products, equipment, or services and address environmental changes through the EMS. For measuring performance-based improvement, targets must be quantifiable and use metrics that are related to the organization's overall goals. Most organizations have set some quantitative goals for various process waste streams, for example, reducing sludge production 10% by 2002 based on amount of wastewater treated. The EMP establishes the frequency at which the objectives and targets will be reviewed.

Continual Improvement

In many organizations, operational controls have been implemented for achieving waste reduction goals, although responsibility for achieving these goals has not always been designated. The EMS identifies and provides for the planning and management of all the organization's operations and activities, including facility maintenance, in order to achieve operational control and maintain compliance.

The EMS establishes documented procedures for preventing, detecting, investigating, promptly correcting, and reporting (both internally and externally) actual and potential accidents, emergency situations, and environmental violations. The EMS includes procedures for tracking any preventive and corrective actions that are taken. If an environmental violation or accident resulted from a weakness in the system, the EMS is updated and refined, ensuring that similar situations are avoided. The EMS also establishes documented procedures for mitigating any adverse impacts on the environment that may be associ-

ated with accidents or emergencies. An EMS provides for the testing of emergency procedures when it is practicable.

EMS training programs ensure that all employees, suppliers, and contractors whose job roles may impact objectives, targets, and compliance are trained and capable of carrying out their responsibilities. The organization should evaluate competency for employees whose work may create significant environmental impacts. The organization must date and retain training records, training materials, and documents demonstrating evaluation of employee awareness and competency.

EMS documentation describes how all of the system elements will be integrated into the organization's overall decision-making and business planning process and provide direction to all relevant environmental procedures. An EMS document control system includes procedures for maintaining and protecting documents and other records as objective evidence of compliance and effectiveness. The EMS specifies retention times for environmental records in accordance with relevant laws.

Management must appoint a representative to ensure implementation and review of the EMS. The EMS requires periodic and objective auditing and review of the organization's environmental system effectiveness and compliance. Without top management review, visible involvement, and support, the EMS will not generate significant environmental improvement or better results over the current management system. This is the most important element of the EMS because management becomes a source of direction and oversees development of action items for sustainable improvement and long-term value creation. Management review promotes organizational leadership by demonstrating a commitment to environmental responsibility. The scope and frequency of the review will depend on the size and complexity of the organization's environmental impacts.

Organizations are discovering that their investments in EMSs are leading to improved environmental performance and compliance with benefits for the environment and community. An EMS provides a good method for establishing and implementing a P2 program. To achieve maximum environmental benefits, the EMS should embody the "plan, do, check, and act" model for continual improvement. This model ensures that environmental impacts are systematically identified, controlled, and monitored. The EMS helps ensure more consistency by organizations in achieving and maintaining compliance, promoting results-oriented efforts, and attaining more reliable data on environmental performance. Effective use of an EMS can be viewed as a demonstration of environmental responsibility and leadership by organizations. An EMS provides the basis for collaborating with regulatory agencies to enhance suitability and effectiveness and promote a leadership, performance-based system.

An EMS document control system includes procedures for maintaining and protecting documents and other records as objective evidence of compliance and effectiveness.

Management review promotes organizational leadership by demonstrating a commitment to environmental responsibility.

An EMS provides a good method for establishing and implementing a P2 program. To achieve maximum environmental benefits, the EMS should embody the "plan, do, check, and act" model for continual improvement.

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See the CD-ROM for more reading.

